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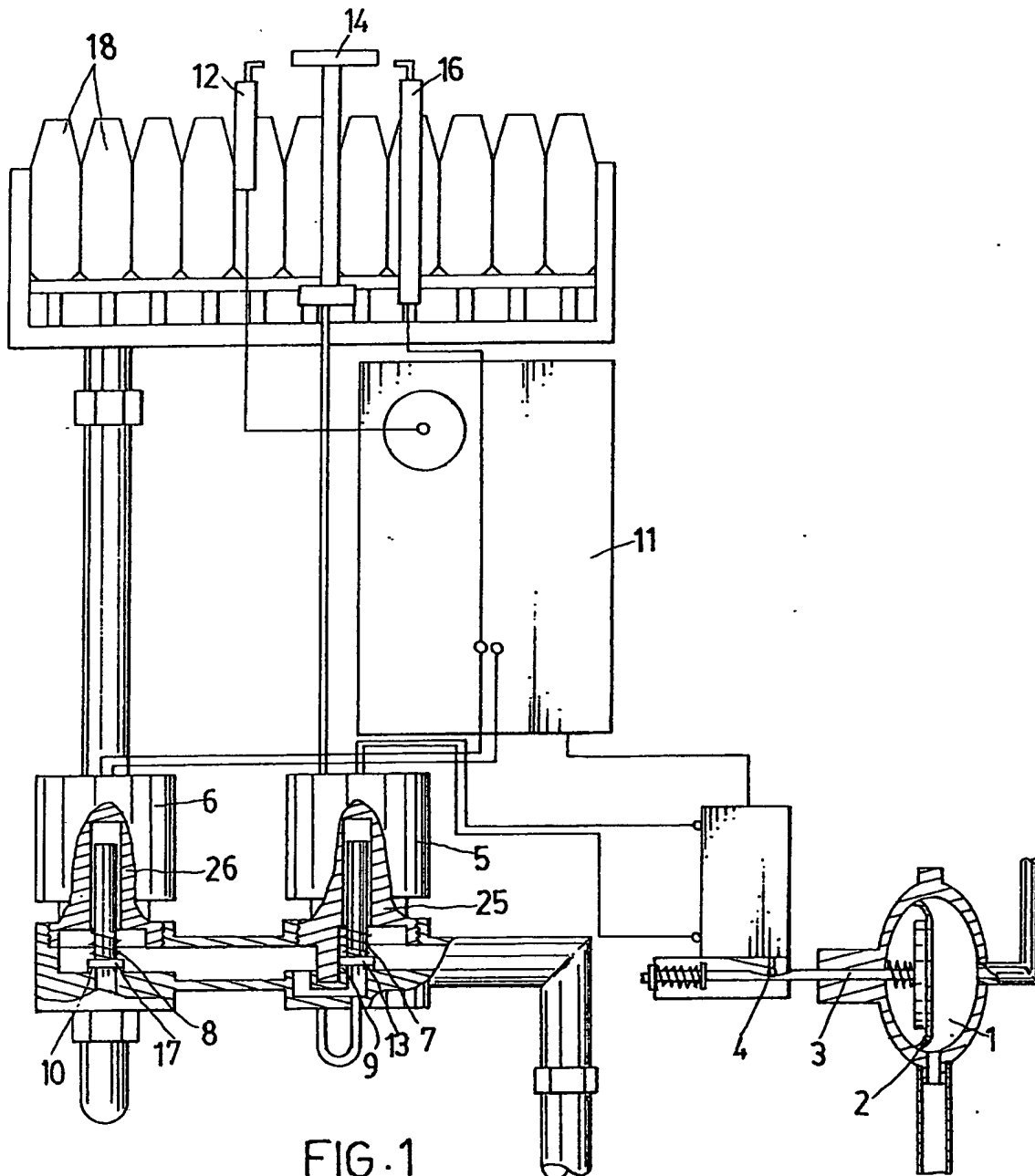
- (21) Application No 8115951  
(22) Date of filing 26 May 1981  
(43) Application published  
1 Dec 1982

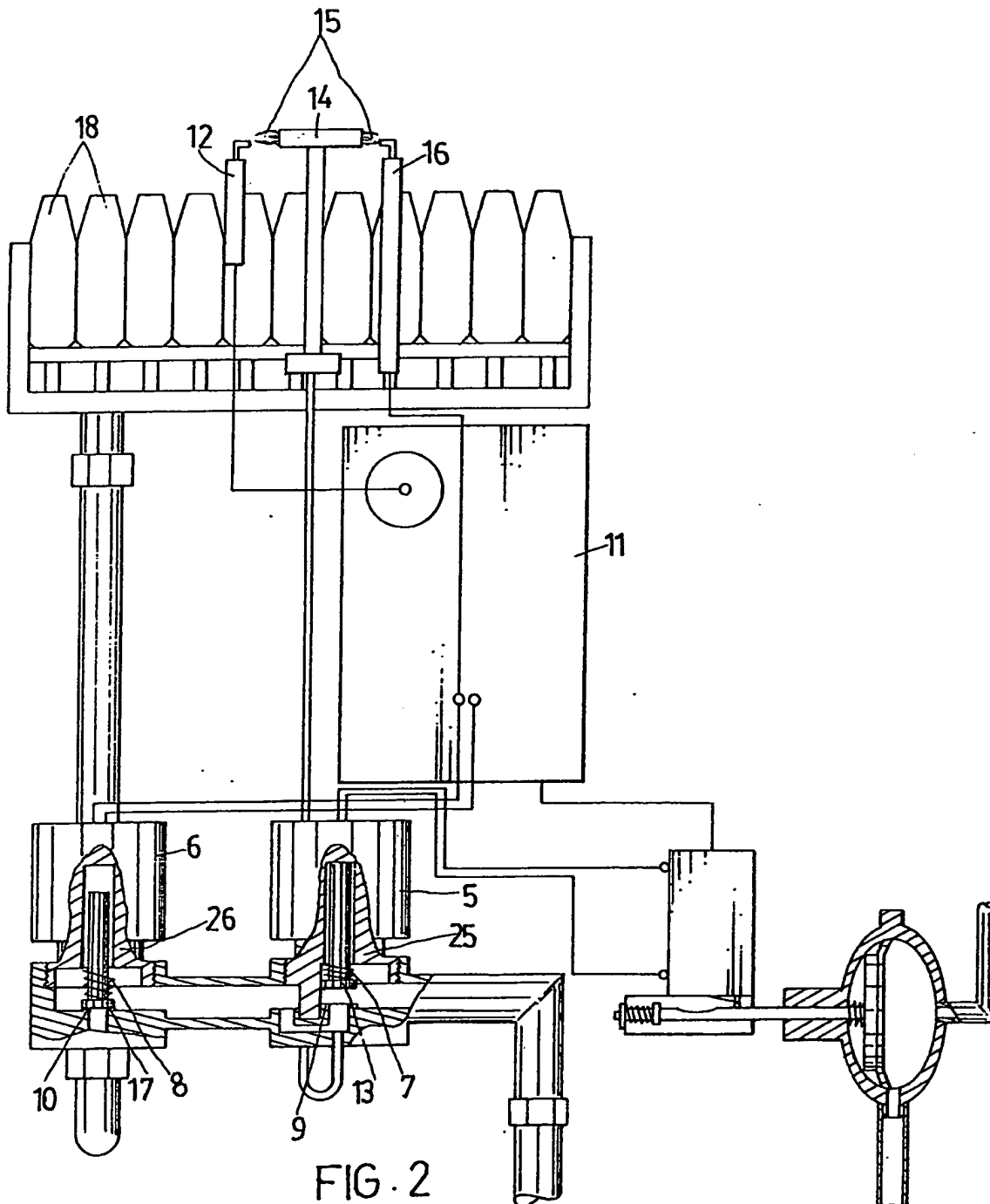
(57) Unlike directly controlling a valve of the gas conduit in the conventional gas heating device, a valve rod 3 which is connecting to a diaphragm valve 1 merely actuates a microswitch 4 for electric control board 11. A first gas conduit and a second gas conduit which communicate separately with the nozzle 14 of a pilot burner and the nozzles of a main burner 18, are controlled respectively by a first solenoid operated valve 5 and a second solenoid operated valve 6. In the vicinity of the nozzle 14 of the pilot burner, a sensor 16 is provided for detecting the presence of the

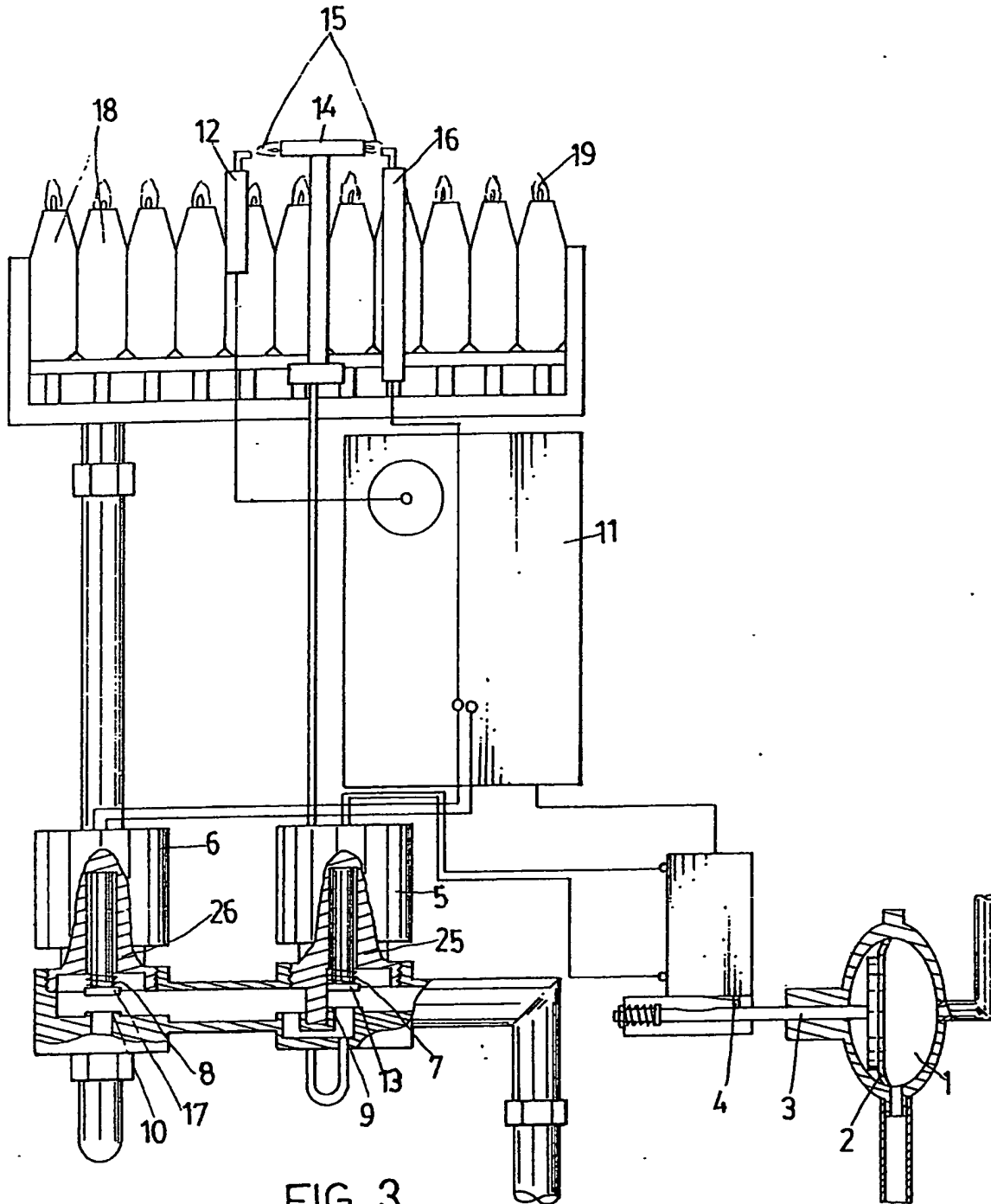
flame 15 of the pilot burner. As the flame 15 of the pilot burner is ignited by the igniter 12, the sensor 16 will send a first electric signal to the electric control board 11 to discontinue the sparking of the igniter 12, and to open the second solenoid operated valve 6 and supply the gas to the main burner 18. As the flame is undesirably blown out during the use of gas heating device, the sensor 16 will send a second electric signal to the electric control board 11 to continue the sparking of the igniter 12, and to actuate the second solenoid operated valve 6 and stop the gas supply to the main burner 18 so as to prevent the unburned toxic gas from flowing out of the nozzle thereof.



GB 2 099 130.A







## SPECIFICATION

## Automatic safety gas heating device

The present invention is related to an automatic safety gas heating device, more

5 particularly, related to a gas heating device for producing instant hot water, in which a diaphragm valve actuated by the water pressure, merely controls a microswitch for an electric control board rather than directly controls the valve of the

10 gas conduit.  
Conventionally, as the water pressure acts on a diaphragm valve to move a valve rod, the valve rod will not only actuate a microswitch to continue the sparking of an igniter, but also simultaneously  
15 drive a first valve disc to open and admit the gas flowing to the nozzle of a pilot burner and thus igniting the pilot flame thereat. As the pilot flame is ignited, a catch which is controlled by a sensor, will be subsequently disengaged from a second  
20 valve disc of a gas conduit of the main flame so that the valve rod will subsequently drive the second valve disc to open and admit the gas flowing to the nozzle of the main burner and burning thereat. In such kind of gas heating  
25 device, as soon as the pilot flame or the pilot flame together with the main flame are blown out by the wind, the igniter will re-ignite the pilot flame, and subsequently the main flame as the abovementioned steps. Hence no unburned gas  
30 can be permitted to flow out of the nozzle. The valve disc of the main flame will maintain in close state so long as the pilot flame is not able to be ignited. Therefore, in case the igniter is damaged, only a slight amount of the unburned gas will flow  
35 out of the nozzle of the pilot burner, this resulting in a serious problem of suffocation and explosive burning. However, as the main and pilot flames are suddenly blown out by a strong wind, while immediate re-ignition is not available, a large  
40 amount of unburned gas will rush out of the nozzle of the main burner and cause explosive burning and suffocation. Moreover, in shortage of electricity the valve disc can not be automatically closed and a great deal of gas will escape from  
45 nozzles of the main burner and pilot burner. Therefore, a further improvement still has to be attempted.

In accordance with the present invention, an automatic safety gas heating device comprises:

50 a valve rod externally connecting to a diaphragm valve which is exerted by the pressure of the water;  
a microswitch for an electric control board, being actuated by the movement of the valve rod;  
55 a first and a second solenoid operated valves connected in series which are separately provided in a first gas conduit communicating with a nozzle of a pilot burner and a second gas conduit communicating with nozzles of a main burner, the  
60 first and second solenoid operated valve being separately actuated by the electric control board;  
an igniter provided near the nozzle of the pilot burner, being actuated by the electric control board; and

65 a sensor provided in the vicinity of the nozzle of the pilot burner for detecting the presence of a pilot flame and inducing the electric control board to send signals, whereby as the microswitch is on and in the presence of the pilot flame, the sensor  
70 will induce the electric control board to send a first electric signal to discontinue the sparking of the igniter, and to open the second solenoid operated valve and supply the gas to the main burner; in the absence of the pilot flame, the  
75 sensor will induce the electric control board to send a second electric signal to continue the sparking of the igniter, and to actuate the second solenoid operated valve and stop the gas supplied to the main burner.

80 In accordance with the other aspect of the present invention, the two solenoid operated valves are so oriented that as the electric control board runs out of electricity, the solenoid operated valves will be in close state due to the  
85 pulling force of gravity.

It is a primary object of the present invention to provide an automatic safety gas heating device having an advantage in that, whenever the pilot and the main burner is out of flame, the valve  
90 which control the supply of gas to these burners will immediately be closed.

It is another object of the present invention to provide an automatic safety gas heating device having an advantage in that, whenever the  
95 electricity runs out, the valves control the supply of gas to the pilot and the main burners will be in close state.

It is a further object of the present invention to provide an automatic safety gas heating device in which the valves controlling the supply of gas to the pilot and the main burners are fully controlled by an electric control board.

These and other objects will be apparent by illustrating a preferred embodiment with  
100 reference to the following drawings in which:—

Fig. 1 is a schematic view illustrating a preferred embodiment in a state that the diaphragm valve is not thrust by the water pressure;

110 Fig. 2 is a schematic view as in Fig. 1, but in the other state, in which the diaphragm valve is exerted by the water pressure and the ignition of the pilot burner has been accomplished; and

Fig. 3 is a schematic view as in Fig. 1, but in  
115 another state, in which the main burner is also fired.

As shown in Fig. 1, as a faucet (not shown) is closed, an elastomeric diaphragm 2 of a diaphragm valve 1 is not thrust by the water pressure and thus sustains in its right position. A valve rod 3  
120 connecting to the elastomeric diaphragm 2 is not driven leftward to actuate a microswitch 4 and an electric control board 11 still maintains in off state. Consequently, each magnet 25, 26 of a first solenoid operated valve 5 and a second solenoid  
125 operated valve 6 is de-energized, each spring 7, 8 thrusts the corresponding valve disc 13, 17 against respective valve seat 9, 10 thereby tightly closing the valve. This is to say, the first and

second solenoid operated valves 5, 6 will be closed very tightly while the faucet is closed.

As shown in Fig. 2, as the faucet is open, the elastomeric diaphragm 2 is thrust by the water pressure to drive the valve rod 3 leftward. The microswitch 4 will be lifted to switch on by leftward displacement of a recess 20. At the left end of the valve rod 3 is a spring 22 provided for thrusting the valve rod 3 back as the faucet is closed thereby switching the electric control board 11 off. As the electric control board 11 is switched on, an igniter 12 begins to sparkle while another signal from the electric control board 11 energizes the magnet 25 of the first solenoid operated valve 5 to lift a valve disc 13 upwards against the force of the spring 7 to permit the gas flowing to the pilot flame nozzle 14, which will be ignited by the sparking of the igniter 12.

As shown in Fig. 3, a sensor 16 is provided near the pilot flame nozzle 14 for detecting the presence of the pilot flame 15. In the presence of the flame 15, the impedance in the sensor 16 varies and induces the electric control board 11 to generate two signals, one of them discontinuing the sparking action of the igniter 12 and the other energizes the magnet 26 of the second solenoid operated valve 6 and lift the valve disc 17 upward to permit the gas flowing to the main burner 18. The main flame 19 is thus fired thereat by the pilot flame 15. After using it, the faucet is closed and the electric control board 11 is switched off. Consequently each solenoid operated valve 5, 6 de-energizes the valve discs are thrust back to close the passage of the gas conduits.

If the pilot flame is blown out undesirably by the strong wind, the sensor 16 will induce the electric control board 11 to send signals to de-energize the magnet 26 thereby closing the valve 6 and at the same time to continue sparking of the igniter 12. The second solenoid operated valve 6 will not open until the pilot flame is re-ignited. Hence, unlike the conventional gas heating device, the possibility of explosive burning and suffocation can be minimized to be negligible.

Further, in shortage of electricity, the solenoid operative valve 5, 6 will automatically close. In case of damage of solenoid operated valves 5, 6 or the springs 7, 8 thereof, the valve discs 13, 17 will be pulled down by the gravity to abutt against the valve seat 9, 10 and close the valves.

Therefore, under no circumstance the unburned

gas is able to escape from the nozzle of the burners.

55 With the invention thus explained, it has to be noted that many variation and modifications can be made without departing from the spirit of the preferred embodiment. Therefore, it is intended that the scope of the present invention  
60 be defined by the appended claims.

#### Claims

1. An automatic safety gas heating device comprising:
  - a valve rod externally connecting to a diaphragm valve which is exerted by the pressure of the water;
  - a microswitch for an electric control board, being actuated by the movement of the valve rod;
  - a first and a second solenoid operated valves connected in series which are separately provided in a first gas conduit communicating with nozzle of a pilot burner and a second gas conduit communicating with nozzles of a main burner, the first and second solenoid operated valves being separately actuated by the electric control board;
  - an igniter provided near the nozzle of the pilot burner, being actuated by the electric control board; and
  - a sensor provided in the vicinity of the nozzle of the pilot burner for detecting the presence of a pilot flame and inducing the electric control board to send signals, whereby as the microswitch is on and in the presence of the pilot flame, the sensor will induce the electric control board to send a first electric signal to discontinue the sparking of the igniter, and to open the second solenoid operated valve and supply the gas to the main burner; in the absence of the pilot flame, the sensor will induce the electric control board to send a second electric signal to continue the sparking of the igniter, and to actuate the solenoid operated valve and stop the gas supply to the main burner.
2. An automatic safety gas heating device according to claim 1, in which the two solenoid operated valves are so oriented that as the electric control board runs out of electricity, the solenoid operated valves will be in close state due to the pulling force of gravity.
3. Automatic safety gas heating device as hereinbefore described with reference to the accompanying drawings.

PUB-NO: GB002099130A

DOCUMENT-IDENTIFIER: GB 2099130 A

TITLE: Automatic safety gas heating device

PUBN-DATE: December 1, 1982

ASSIGNEE-INFORMATION:

| NAME             | COUNTRY |
|------------------|---------|
| MING FUANG HUANG | N/A     |

APPL-NO: GB08115951

APPL-DATE: May 26, 1981

PRIORITY-DATA: GB08115951A ( May 26, 1981)

INT-CL (IPC): F23N005/00

EUR-CL (EPC): F23N005/02

US-CL-CURRENT: 431/18

ABSTRACT:

CHG DATE=19990617 STATUS=O> Unlike directly controlling a valve of the gas conduit in the conventional gas heating device, a valve rod 3 which is connecting to a diaphragm valve 1 merely actuates a microswitch 4 for electric control board 11. A first gas conduit and a second gas conduit which communicate separately with the nozzle 14 of a pilot burner and the nozzles of a main burner 18, are controlled respectively by a first solenoid operated valve 5 and a second solenoid operated valve 6. In the vicinity of the nozzle 14 of the pilot burner, a sensor 16 is provided for detecting the presence of the flame 15 of the pilot burner. As the flame 15 of the pilot burner is ignited by the igniter 12, the sensor 16 will send a first electric signal to the electric control board 11 to discontinue the sparking of the igniter 12, and to open the second solenoid operated valve 6 and supply the gas to the

main

burner 18. As the flame is undesirably blown out during the use of gas heating device, the sensor 16 will send a second electric signal to the electric control board 11 to continue the sparking of the igniter 12, and to actuate the second solenoid operated valve 6 and stop the gas supply to the main burner

18 so as to prevent the unburned toxic gas from flowing out of the nozzle thereof. <IMAGE>